Canadian Exports to Nepal In-Furrow Starter Fertilizer

Nicole L. Sharp

Part 1: Product Information

In-Furrow Starter Fertilizer

Nitrogen, phosphorus, and potassium are the three macronutrients a plant needs to grow. Starter fertilizer equipped with these three elements, can be utilized come early spring when the crops are being planted. The fertilizer is added below the planted seeds or in the furrow which adds to the number of macronutrients in the root zone (Mallorino, Bergmann & Kaiser, 2011). This can then speed up the growth of the plant's roots as well as increase the stamina of the new plants (Alpine, 2012). According to the article, "Corn Responses to In-Furrow Phosphorus and Potassium Starter Fertilizer Applications", studies have shown that in-furrow starter fertilization can also increase the yield that a crop produces (Mallorino, Bergmann & Kaiser, 2011). Starter fertilizer may also help the planted crops when the growth of their root system is set back due to conditions such as weather, poor seedbed conditions or if the roots have been damaged by factors such as pathogens or pests (Pioneer, 2016). There are several companies in Canada that manufacture in-furrow starter fertilizer. A few examples of such companies include: Alpine, Omex Canada and Loveland Products.

https://www.alpinepfl.com/east/products/

"Alpine G24"

Alpine's G24 is a specific in-furrow starter fertilizer that uses raw materials to create a nutritious source of nitrogen, phosphorus, and potassium (Alpine, 2012). According too Alpine the product, "maximizes plant nutrient solubility, minimizes salt index and minimizes equipment

corrosion." (Alpine, 2012). An attribute that sets this product apart from others is that eighty percent of the phosphorus contained in the fertilizer is in the orthophosphate state. This means it has the potential to be instantly available to be absorbed by the roots of the plant. The product itself is a green liquid and has a slight ammonia smell. It weighs 1.34kg for every litre, and has a pH of 6.3 – 7.0 (Alpine, 2012).

When the fertilizer is prepared, it is important that all the ingredients are thoroughly mixed and only what will be immediately used is prepared (Alpine, 2012). When mixing, first add half the total amount of water to the spray mechanism then add any micronutrients or other solutions to the mixture (if it is a powder, pre-mix it with water and do not add any potash or urea mixtures). The recommended amount of Alpine liquid fertilizer can then be added to the spray mechanism, as well as the other half of the water and mixed (Alpine, 2012). It is suggested that this product not be stored for long periods of time. It is also suggested that on light and sandy soils where the nutrient matter is less than two percent, the fertilizer should be reduced by a rate of two litres per acre (Alpine, 2012).

To test the potential for Alpine's G24 starter fertilizer, Alpine made several test plots over the years (Alpine, 2016b). Over the course of twenty-eight years, they tested the results of G24 liquid starter fertilizer vs dry phosphorus on corn. Alpine found that the corn that had the liquid starter fertilizer applied to it had an increased yield on average of 3.1 more bushels (134.2 vs 131.1) then the corn that had dry phosphorus added to it. Alpine also tested the results of G24 liquid starter fertilizer vs no fertilizer or corn over a twenty-two-year period. It was found that the corn with the fertilizer applied to it had an increased yield on average of 6 more bushels (146.1 vs 140.1) then the corn that had no fertilizer applied (Alpine, 2016b).

“Starter P”

Omex Canada is another fertilizer company that “maximizes phosphorus use efficiency” with their in-furrow starter fertilizer called “Starter P” (Stermscheg, n.d). According to Omex, soil in the spring time is typically low in phosphorus and it is also the least mobile macronutrient in the soil. Therefore, having the phosphorus applied close to the seed increases the potential for the phosphorus to be taken up quickly by the seedling. This can then lead to a stronger and higher yielding crop. As well as Alpine G24, Starter P is also a low salt index liquid fertilizer. It can be mixed with other fertilizers and the application rate is three to five U.S gallons per acre in the furrow (Stermscheg, n.d).

Omex findings:

Check

Starter P

Check

Starter P

(Stermscheg, n.d)

By observing the above pictures, comparing the affects of a crop that had Starter P applied to it, to a crop that did not, one can see that the crop that had Starter P applied produced a much greater yield (Stermscheg, n.d).

"Riser"

A third example of an in-furrow starter fertilizer is Loveland Products' "Riser" (Loveland Products, n.d). It too is a phosphorus fertilizer product that according to Loveland Products has, "proven to accelerate plant emergence and increase root mass" (Loveland Products, n.d). The fertilizer also contains slightly higher levels of zinc and ammonia acetate then other liquid fertilizers. The ammonia acetate is used to make more nutrients available. It takes out nutrients that may be concealed in the soil and also increases the growth of both root hairs and root shoots. Zinc is meant to help with the roots ability to take up the nutrients. It excites the production of auxin which can potentially increase the growth of the roots and nutrient uptake. One last thing that sets this product apart is that the acetate is also meant to give energy for more respiration, and micronutrients such as iron, copper, manganese, and zinc are meant to promote the activation of enzymes to help improve photosynthesis (Loveland Products, n.d).

Contact Information

Table 1: Shows locations of companies listed above as well as contact information.

Company	Location	Phone
Alpine	New Hamburg, Ontario	519 – 662 – 2352
	Belle Plaine, Saskatchewan	877 – 832 – 8815
Omex Canada	Oak Bluff, Manitoba	204 – 477 – 4052
Loveland Products	High River, Alberta	1 – 800 – 328 – 4678

(Alpine, 2016a) (Stermscheg, n.d) (Loveland Products, n.d)

Canadian Benefits of Exporting

The Canadian Fertilizer industry, annually contributes billions of dollars to Canada's economy and employs more than 12 000 Canadians across the country (Fertilizer Canada, 2016). Currently Canada supplies twelve percent of the word's fertilizer and exports to over eighty countries (Fertilizer Canada, 2016). The more that Canada exports fertilizers, the more revenue is made and the more job opportunities are created. At the moment, Loveland Products export, all over the world (Loveland Products, n.d), Omex Canada does not specifically handle the exporting globally, instead their branch in the United Kingdom handles it (A. Fabris, personal communication, November 25, 2016). Omex Canada only exports and imports from the United States (A. Fabris, personal communication, November 25, 2016). Unfortunately, Alpine does not export their products due to costs, instead they have manufacturing facilities in both the United States and Canada (K. Brett, personal communication, November 10, 2016). However, to help smaller and medium sized companies, Canada does offer support in the agriculture exporting field.

Support Available for Exporting Product

It can be difficult for companies to export their products if the costs are too high, but the government of Canada does offer support to these companies. For example; small and average size companies are offered by "Agriculture and Agri-food Canada" funding of a maximum of fifty thousand dollars a year to help them export (Government of Canada, 2016).

Process of Exporting

The fertilizers are first manufactured at each company's manufacturing facility. For example, Alpine has two manufacturing facilities in Canada, one in Ontario and a second in Saskatchewan (Alpine, 2016a). Canada already exports products to Nepal, and through the Canada-Nepal Business Executive Committee (CNBEC) the product could be exported first to India and then to Nepal (Government of Canada, 2014). Canada typically ships their products by sea using large shipping companies such as "Maersk sealand", to larger ports and then the products are distributed by sources of land transportation such as railways or trucks (Asia Pacific Foundation of Canada, 2003).

The time it takes to ship products from Canada to India may vary because various stops at other ports may be made along the way (Asia Pacific Foundation of Canada, 2003). For example, a shipment from Montreal to Calcutta may take almost twice as long as a trip from Montreal to Bangkok (a trip equal in distance) because there would be three stops made at different ports between Montreal and Calcutta, whereas only one stop at one port between Montreal and Bangkok (Asia Pacific Foundation of Canada, 2003).

Table 2 shows possible trade routes from Canada to India.

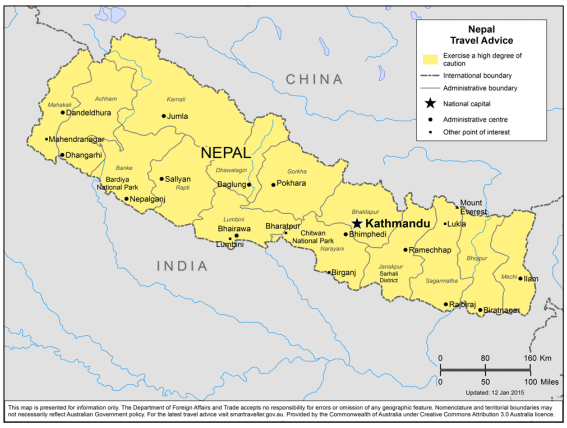
Origin Canada	**Transshipment Point #1**	**TS Point #2**	**TS Point #3**	**TS Point #4**	**Final Destination India**	**Transit Time**	**Distance Nautical Miles**
Vancouver	Tacoma (road)	Tanjung Pelepas (sea)	Colombo (sea)	Nhava-Sheva (sea)	Mumbia (Road)	42	9511
Toronto	Montreal (rail)	Rotterdam (sea)	Nhava-Sheva (sea)	_____	Mumbia (Road)	45	8513
Toronto	Montreal (rail)	Rotterdam (sea)	Dubai (sea)	Colombo (sea)	Chenai (sea)	50	9513
Montreal	Rotterdam (sea)	Dubai (sea)	Colombo (sea)	_____	Calcutta (sea)	57	9890
Vancouver	Tacoma (sea)	Yokohama (sea)	_____	_____	Shanghai (sea)	19	5091

Toronto	Vancouver (rail)	Tacoma (Road)	Yokohama (sea)	_____	Shanghai (sea)	24	6908
Toronto	Vancouver (rail)	Tacoma (Road)	Tanjung Pelepas (sea)	_____	Ho Chi Minh City (sea)	33	8480
Montreal	Vancouver (rail)	Tacoma (Road)	Taiwan (sea)	Thailand (sea)	Bangkok Thailand (Rail)	31	9904

(Asia Pacific Foundation of Canada, 2003)

Once the shipment of products arrives in India, the next step is to transport it to Nepal. This can be done because of the "Treaty of Trade and Transit" that exists between India and Nepal (Tameja, Bimal, & Dayal, 2016). There are two main modes of transportation used from India to Nepal, on the railway in wagons, or on the road in truck containers. Both transportation methods require legitimate documents such as: a letter of authority from the importer, a copy of the insurance policy and an original packing list (Tameja, Bimal, & Dayal, 2016). The railway is most commonly used when exporting shipments out of Nepal, and the road is most commonly used when importing shipments into Nepal. Therefore, in this case, the use of a truck is most likely the best mode of transportation. In the case of shipping fertilizer, the trucks do not need to be sealed, they can be open (Tameja, Bimal, & Dayal, 2016). The in-furrow starter fertilizers exported would mostly be used in the Terai region of Nepal because that area is already semi mechanized. This means that there are uses of tractors, harvesters, and chemical fertilizers (T. Chapagain, personal communications, September 16, 2016).

Part 2: Potential Benefits to Nepal



http://smartraveller.gov.au/Countries/as

Introduction to Nepal

Nepal can be found in south Asia as a landlocked country between China and India (T. Chapagain, personal communication, September 16, 2016). It is about 147 000 km2 in size and has a population of about twenty-eight million (T. Chapagain, personal communication, September 16, 2016). The country has three main regions, mountain, hills and terai. It is estimated that eighty percent of the population of Nepal is involved in agriculture (Nations Encyclopedia, n.d.). Most Nepalese farmers practice subsistence farming, meaning they only grow enough food to provide for their families (T. Chapagain, personal communication, September 16, 2016). Because of this there are many areas in Nepal where food is scarce, particularly in the mountains where it is tough to transport goods (Nations Encyclopedia, n.d.).

The use of chemical fertilizers is not a new concept to Nepal (Nations Encyclopedia, n.d.). In 2013, a case study called, the "Trend of Chemical Fertilizer Consumption in Nepal" was done (Ghimire, 2013). The study found that the most common chemical fertilizer used in Nepal is urea, followed by diammonium phosphate, and then potash. Nepal has no sources to produce any of these products on their own, and therefore almost all the chemical fertilizers used are imported, two thirds of which are imported from India. Once the chemical fertilizers are imported to Nepal, the main dealer of the fertilizer is "Agriculture Inputs Company Ltd.". This company distributes the fertilizers primarily to the Terai region where the majority of the crops are grown, then to the hills and mountain regions (Ghimire, 2013).

Potential Benefits to Nepal

Potential to Increase Crop Yield

According to the Ministry of Agricultural Development in Nepal the overall national crop productivity is very low (Government of Nepal, 2013). When comparing Nepal's crop production to another country such as Canada's, in the 2011/2012 year Nepal produced a total of approximately 9.5 million metric tonnes of cereal crops (Government of Nepal, 2013) where as Canada produced a total of approximately 48.3 million metric tonnes (Statista, n.d). Cereal crops can be defined as grains such as wheat and corn (New World Encyclopedia, 2013).

One must consider however, that Canada is also 64 times greater than Nepal in surface area (T. Chapagain, personal communication, September 16, 2016), so it is expected that Canada would produce more. A more accurate comparison would be to compare the yields in tonnes per hectare. The following Table shows that in the 2011/ 2012 year the total yield for cereal crops was 2.7 tonnes per hectare (T. Chapagain, personal communication, September 16, 2016) and according to the World Bank Organization, Canada's total yield was 3.67 tonnes per hectare (The World Bank, 2016). This means that Canada's yield produces almost one more tonne of cereal crops to the hectare.

Table 3 shows the total cereal crops produced in Nepal (tonnes per hectare) in the 2011/2012 year

Major Growing Areas	Crops	Area (000, ha)	Production (000, mt.)	Yield (t/ha)
Terai	Paddy	1531	5072	3.31
Terai + Hill	Maize	871	2179	2.50
Terai + Hill	Wheat	765	1846	2.41
Hill	Millet	278	315	1.13
Hill + Mountain	Barley	28	35	1.25
Mountain	Buckwheat	10	10	0.97
TOTAL		3484	9457	2.71

(T. Chapagain, personal communication, September 16, 2016)

According to the Food and Agriculture Organization of the United Kingdom, there are several possible reasons for why Nepal's overall national crop productivity is very low (Sharma, n.d). Some of these reasons include: a lack of soil micronutrients, a continual decline in organic materials in the soil and little usage of efficient fertilizers. In order for crops to grow, the roots need to take up the nutrients in the soil (Government of Canada, 2015). For a crop to grow in the same field the following year, the nutrients in the soil need to be replenished (Government of Canada, 2015). The usage of an in-furrow starter fertilizer such as Alpine's "G24", Omex Canada's "Starter P" and Loveland Products' "Riser" can help replenish the nutrients in the soil and allow the roots of the plant to make use of them right away. This then can potentially help increase the yield of Nepal's crops.

Potential to Lower Poverty

http://cffn.ca/about-nepal/poverty-in-ne

Nepal is said to be the poorest country of South Asia and it is amongst the top twenty poorest countries of the world (Canada Foundation for Nepal, n.d). For many generations poverty is a continuous cycle. Eighty percent of the population live away from the cities and depend on subsistence farming to survive (Canada Foundation for Nepal, n.d). The use of in-furrow starter fertilizers can potentially help increase their crop yields. This can then help produce more food and more income for the farmers and their families to potentially lower the challenges that poverty may bring.

Challenges

Costs

For many smaller company's, shipping globally is not a realistic option because of costs. For example, Ken Brett from Alpine explained that due to costs they do not export their products outside of North America (K. Brett, personal communication, November 10, 2016). In Canada, a liquid starter fertilizer costs about twenty-five dollars an acre or can be purchased at about one dollar and thirty-three cents a Litre. (B. Teasdale, personal communication, November 27, 2016). This amount may vary depending on the company. When shipping costs are added on top of that it can be very difficult for subsistence farmers in Nepal to purchase products like that on their own. It may be made possible if a number of different farmers purchased the fertilizer together.

Lack of Agricultural Education

The farmers of Nepal may need to be taught about the nutrients in the soil and how in-furrow starter fertilizers are intended to work. Soil samples may need to be taken in order to see what nutrients are lacking and what starter fertilizers would suit their soil needs best.

Competitive products

It may not be realistic for Nepal to import in-furrow starter fertilizers from Canada when the world's second largest producer of fertilizer is their neighbour, India (ICL Fertilizers, n.d). India currently has over a hundred different fertilizer companies, fifty-six of which are large scale companies and seventy-two are small and average sized companies (Government of India, 2016). One of the companies, "ICL Fertilizers India", is globally one of the largest companies and supplies manufacturers all over the world with their products. They produce millions of tonnes of fertilizer a year (ICL Fertilizers, n.d). Table 4 below gives a list of other popular fertilizer companies in India.

Table 4 shows a list of the location and contact information of other fertilizer companies in India

Name of Fertilizer Company	Address	Contact No
The Fertiliser Association of India	FAI House, 10, Shaheed Jit Singh Marg, New Delhi - 110 067, INDIA	Tel+91-11-26567144, Email: general@faidelhi.org Website : www.faidelhi.org
Brahmaputra Valley Fertilizer Corporation Ltd	Namrup, P.O. Parbatpur – 786623 Dist. Dibrugarh (Assam), India	Tel: 0374-2500207,0374-2500207 Email: info@bvfcl.co.in Website : www.bvfcl.com
Chambal Fertilisers and Chemicals Ltd.	Corporate One, First Floor, 5 Commercial Centre, Jasola, New Delhi - 110 025 India	Tel: +91-11 41697900 / 46581300 Fax: +91-11-40638679 Website : www.chambalfertilisers.in
Coromandel International Ltd.	Coromandel House, Sardar Patel Road, Secunderabad 500 003, Telangana, India.	Tel: +91 40 27842034 Fax: 91 40 27844117 Website : www.coromandel.biz/
Deepak Fertilisers and Petrochemicals Corporation Ltd.	Opp. Golf Course, Shastri Nagar, Yerwada, Pune 411 006, India	Tel: +91 20-6645 8000 Fax: +91 20-2668 3727 Website : www.dfpcl.com

Name of Fertilizer Company	Address	Contact No
Fertilisers & Chemicals Travancore Ltd.	FACT Petrochemical, Udyogamandal - 683 501, Kochi, Kerala, India	Tel: 2545042 Fax: 0120-2412384 E-mail : neeru.abrol@nfl.co.in Website : www.fact.co.in
Hindalco Industries Ltd.	5th Floor, Vandana Building, Tolstoy Marg, Tolstoy Marg, New Delhi, Delhi 110055	Tel: 011 2373 0975 **Fax:** 91-22-2436 2516 / 2422 7586 Website : www.hindalco.com
Greenstar Fertilizers Ltd	Muthiapuram Post, Tuticorin - 628 005 Tamilnadu, India	Tel: +91(461) 2355411 Fax: +91(461) 2357001 Email: narayans@greenstar.net.in Website :www.greenstarfertilizers.com
Gujarat Narmada Valley Fertilizers & Chemicals Ltd.	P.O.: Narmadanagar – 392 015 District: Bharuch, Gujarat, India	Tel:- +91 - 2642 - 247001, 247002 Fax:-+91-2642-228063 E-Mail:-vssirohi@gnfc.in Website : http://gnfc.in
Gujarat State Fertilizers & Chemicals Ltd.	P.O. Fertilizernagar -391 750, Dist. Vadodara, Gujarat, India	Tel:- +91-265-2242451, 2242651, 2242751 Fax:- +91-265-2240966, 2240119 Website : www.gsfclimited.com
Indian Farmers Fertiliser Cooperative Ltd	IFFCO Sadan, C-1, District Centre, Saket Place, New Delhi - 110017	Phone: 011-42592626,26542625 Website : www.iffco.in
Indo Gulf Fertilisers Ltd. (A unit of Aditya Birla Nuvo Ltd.)	Indian Rayon Compound Veraval 362 266 Gujarat, India	Tel: 91-2876 245711 Email: abnlsecretarial@adityabirla.com Website : www.adityabirlanuvo.net
Krishak Bharart Cooperative Ltd.	KRIBHCO Bhawan, A-l0, Sector-l, NOIDA Gautam BudhNagar U.P, India-201 301	Tel:- 0120-2534631, 2534632 Fax:- 0120-2537113 Website : http://kribhco.net
Kribhco Shyam Fertilisers Ltd.	A-60, Kailash Colony, New Delhi-110048	Tel:- 91-120-2443701 Website : www.ksfl.in
Mangalore Chemicals & Fertilizers Ltd.	Flat No.1002, 10th Floor, Bhikaji Cama Bhavan, Bhikaji Cama Place,New Delhi - 110 066	Tel:- 011-26181760 Fax:- 011-26107818 Website:www.mangalorechemicals.com
Madras Fertilizers Ltd.	Manali, Chennai - 600 068	Tel:- 044 - 25941001 Website: http://madrasfert.nic.in
Nagarjuna Frtilizers & Chemicals Ltd	Plot No 61, Nagarjuna Hills Hyderabad-500082	Tel: (+91 40) 23351462 Website : www.nagarjunagroup.com
National Fertilizers Ltd.	A-11, Sector 24, Noida, Uttar Pradesh 201301	Phone : 0120-2412383, 2414085 Fax : 0120-2412384 E-mail : neeru.abrol@nfl.co.in Website : www.nationalfertilizers.com
Paradeep Phosphates Ltd.	Pandit Jawaharlal Nehru Marg, Bhubaneswar- 751 001 Orissa.	Mobile No : (O)94370 77123 Fax : 91(6722) 229625/229605 E-Mail - info@paraphos.com Website:www.paradeepphosphates.com

Name of Fertilizer Company	Address	Contact No
Rashtriya Chemicals & Fertilizers Ltd.	Priyadarshini Building, Eastern Express Highway Sion, Mumbai-400 022	Tel:- **022-2552 2000/022-2552 2040** Website : www.rcfltd.com
Shriram Fertilisers & Chemicals	1st Floor, Kanchenjunga Building, 18 Barakhamba Road, New Delhi - 110001 India	Tel.: +91 11 23316801 Fax: +91 11 23318072 Website : www.dscl.com
Southern Petrochemicals Ind. Ltd	SPIC House 88 Mount Road Guindy Chennai 600032 India	Tel+91.44.22350245 E-mail spiccorp@spic.co.in Website : www.spic.co.in
Tata Chemicals Ltd.	Leela Business Park Andheri – Kurla Road, Andheri (E) Mumbai 400 059	Tel: (022) 66437400 Fax: (022) 6643 7598 / 99 Website : www.tatachemicals.com
Zuari Agro Chemicals Ltd.	5th Floor, Global Business Park, Tower A,M. G. Road, Sector 26, Gurgaon - 122 002, Haryana.	Tel No.: 91-124 -4827800 Fax No.: 91-124- 4212046 Website : **http://zuari.in**

Conclusion

In conclusion, there are several Canadian fertilizer companies that produce in-furrow starter fertilizers. In-furrow starter fertilizers have the potential to make nutrients available to the roots of plants to increase their growth and potentially increase the crop yield. These fertilizers can help a food deficit country like Nepal produce a greater yield while increasing the Canadian economy and creating more jobs for Canadian manufacturers. Unfortunately, many of these Canadian companies are smaller globally and due to costs, it can be challenging to export their products. These companies should take advantage of the funding that is available to them by the government. The government of Canada should continue to provide resources and funding for the smaller companies to use. India also borders Nepal and is a big producer of fertilizers. Nepal can likely import their fertilizers for a lower cost from India. Even if in-furrow starter fertilizers can not be imported from Canada, Nepal should still look into importing them from countries

like India because they are a good source of macronutrients for their soil and crops and can benefit the country of Nepal in multiple ways.

Future Studies

If the project of In-furrow starter fertilizers in Nepal was to be pursued in the future, many other future studies would have to be conducted further. There would be a need to contact different companies in Nepal who would import the product and distribute it. Farmers and others involved in the fertilizer sector of agriculture, would have to be educated on soil sampling, and be taught what macronutrients could be added to the soil and how much of each is needed. Other environmental studies may have to be done to develop an in-furrow starter fertilizer that is right for the different soils of Nepal.

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